

CLAIMS

1. A longitudinal type of thermal processing apparatus comprising:
 - a processing container made of quartz, having an opening part at a lower end thereof,
 - a lid provided under the opening part, capable of moving up and down so as to open and close the opening part,
 - a holder provided on the lid, capable of hold a plurality of objects to be processed in a tier-like manner, and
 - a heating unit provided around the processing container,wherein
 - the lid has an inner lid part made of quartz that comes in contact with a lower-end surface of the opening part, and an outer lid part made of a metal that covers an outside surface of the inner lid part,
 - an outer-periphery upper portion of the inner lid part is located inside an outer-periphery edge of the lower-end surface of the opening part, and
 - an O-ring is provided on an inner-periphery upper portion of the outer lid part so as to come in contact with a surface of the outer-periphery upper portion of the inner lid part and the lower-end surface of the opening part in order to seal therebetween.
2. A longitudinal type of thermal processing apparatus according to claim 1, wherein
 - a cooling-medium channel is provided in a vicinity of the O-ring in the outer lid part in order to cool the O-ring.
3. A longitudinal type of thermal processing apparatus according to claim 1 or 2, wherein
 - a space is formed between the inner lid part and the outer lid part, and
 - a planer heater for heating the inner lid part is provided in the space out of contact with the inner lid part.
4. A longitudinal type of thermal processing apparatus comprising:
 - a processing container made of quartz, having an opening part at

a lower end thereof,

a lid provided under the opening part, capable of moving up and down so as to open and close the opening part,

a holder provided on the lid, capable of hold a plurality of objects to be processed in a tier-like manner, and

a heating unit provided around the processing container,
wherein

the lid has an inner lid part made of quartz that comes in contact with a lower-end surface of the opening part, and an outer lid part made of a metal that covers an outside surface of the inner lid part, and

the lower-end surface of the opening part and an upper-end surface of the inner lid part, which come in contact with each other, are mirror-finished.

5. A longitudinal type of thermal processing apparatus according to claim 4, wherein

a first flange is provided at an outside periphery of the opening part,

the first flange is located higher than the lower-end surface of the opening part,

a second flange is provided at an outside periphery of the inner lid part,

the second flange is located lower than the upper-end surface of the inner lid part,

a flange holder made of a metal is provided on the first flange via a sheet made of a resin,

a first O-ring that seals between the first flange and the flange holder and a second O-ring that seals between the second flange and the flange holder are provided on the flange holder, and

the first O-ring, an inner surface of the flange holder from the first O-ring to the second O-ring, the second O-ring, an upper surface of the second flange inside the second O-ring, an outer surface of the inner lid part from the second O-ring to the upper-end surface, an outer surface of the opening part from the lower-end surface to the first flange, and a lower surface of the first flange inside the first O-ring form a channel for vacuuming.

6. A longitudinal type of thermal processing apparatus according to claim 5, wherein

a central opening part is formed at a central portion of the outer lid part,

a third flange of a rotation-introducing mechanism, which causes the holder to rotate, is fixed on a lower surface of the central opening part so as to close the central opening part,

a rotation shaft of the rotation-introducing mechanism extends upward from a central portion of the third flange,

a boss part that surrounds the rotation shaft is formed at a central portion of the inner lid part,

double third and fourth O-rings are provided between a lower-end surface of the boss part and an upper surface of the third flange, which come in contact with each other, and

a gas-discharging hole for vacuuming a space defined by the lower-end surface of the boss part, the upper surface of the third flange and the third and fourth O-rings is formed in the first flange.

7. A longitudinal type of thermal processing apparatus according to claim 6, wherein

the gas-discharging hole is connected to the channel for vacuuming.

8. A longitudinal type of thermal processing apparatus according to claim 4, wherein

a central opening part is formed at a central portion of the outer lid part,

a third flange of a rotation-introducing mechanism, which causes the holder to rotate, is fixed on a lower surface of the central opening part so as to close the central opening part,

a rotation shaft of the rotation-introducing mechanism extends upward from a central portion of the third flange,

a boss part that surrounds the rotation shaft is formed at a central portion of the inner lid part,

double third and fourth O-rings are provided between a

lower-end surface of the boss part and an upper surface of the third flange, which come in contact with each other, and

a gas-discharging hole for vacuuming a space defined by the lower-end surface of the boss part, the upper surface of the third flange and the third and fourth O-rings is formed in the first flange.

9. A longitudinal type of thermal processing apparatus according to any of claims 5 to 8, wherein

a plurality of patches made of a resin is screwed on the flange holder so as to come in contact with an outer-periphery surface of the first flange to form a predetermined gap between the flange holder and the first flange.

10. A longitudinal type of thermal processing apparatus comprising:

a processing container made of quartz, having an opening part at a lower end thereof,

a lid provided under the opening part, capable of moving up and down so as to open and close the opening part,

a holder provided on the lid, capable of hold a plurality of objects to be processed in a tier-like manner, and

a heating unit provided around the processing container,
wherein

the lid has an inner lid part made of quartz that comes in contact with a lower-end surface of the opening part, and an outer lid part made of a metal that covers an outside surface of the inner lid part,

an outer-periphery upper portion of the inner lid part is located inside an outer-periphery edge of the lower-end surface of the opening part,

a fourth flange is provided on an outer lower portion of the inner lid part,

a second flange holder is provided on the outer lid part to be located between the lower-end surface of the opening part and an upper surface of the fourth flange to hold the fourth flange,

a fifth O-ring that seals between the lower-end surface of the opening part and the second flange holder and a sixth O-ring that seals between the upper surface of the fourth flange and the second flange

holder are provided on the second flange holder, and

a cooling-medium channel is provided in the second flange holder in order to cool the fifth O-ring and the sixth O-ring.

11. A longitudinal type of thermal processing apparatus according to claim 10, wherein

a liquid-receiving part capable of receiving an aqueous solution is provided on the upper surface of the inner lid part, and

a liquid-guiding part is provided at a lower portion of the inner surface of the processing container so as to guide an aqueous solution, which is generated on the inner surface of the processing container and flows thereon, into the liquid-receiving part.

12. A longitudinal type of thermal processing apparatus according to claim 11, wherein

the liquid-receiving part is formed by a liquid-receiving pan made of quartz.